20. Following mortality rates have been observed for a certain type of electronic component.

Month	0	1	2	3	4	5	6
% surviving at the end of the month	100	97	90	70	30	15	0

There are 10000 items in operation. It costs Re 1 to replace an individual item and 35 paise per item, if all items are replaced simultaneously. It is decided to replace all items at fixed intervals and to continue replacing individual items as and when they fail. At what intervals should all items be replaced? Assume that the items failing during a month are replaced at the end of the month.

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APRIL/MAY 2023

CASC42/BASC42/UASC42 — QUANTITATIVE TECHNIQUES – II

Industries Arts & Science College T.V.Malai Kanchipuram

Time : Three hours Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Define PERT.
2. What is Forward Pass Computation and Backward Pass Computation?
3. What is EOQ Model?
4. Define Inventory.
5. What is total elapsed time in Sequencing Problem?
6. State any two assumptions of Sequencing Problem.
7. State Minimax and Maximin Principles.
8. Define Pure Strategy.
9. Enumerate any two situations when the replacement of items is necessary.
10. What is Sudden Failure?

Activity	t_o	t_m	t_p
6-10	4	6	8
7-9	4	8	12
8-9	2	5	8
9-10	4	10	16

(a) Construct the network diagram when scheduled completion is 40 days

(b) Calculate the probability of finishing the project

(i) Within the scheduled time

(ii) Less than 45 days

(iii) Less than 38 days.

17. (a) Using the following information, obtain the EOQ and the total variable cost associated with the policy of ordering quantities of that size. Annual demand = 20,000 units, ordering cost = Rs. 150 per order, and inventory carrying cost is 24% of average inventory value. (5)

(b) Find the most economic batch quantity of a product on a machine if the production rate of that item on the machine is 200 pieces per day and the demand is uniform at the rate of 100 pieces per day. The ordering cost is Rs. 200 per batch and the cost of holding one item in inventory is Rs.0.81 per day. How will the batch quantity vary if the production rate is infinite? (5)

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12. (a) The demand rate for a particular item is 12000 units/year. The ordering cost is Rs. 100 per order and the holding cost is Rs. 0.80 per item per month. If no shortages are allowed and the replacement is instantaneous, determine:

(i) The economic order quantity.

(ii) The time between orders.

(iii) The number of orders per year.

Or

(b) The demand for an item is 8000 units per annum and the unit cost is Re.1/-. Inventory carrying charges of 20% of average inventory cost and ordering cost is Rs. 12.50 per order. Calculate optimal order quantity, optimal order time, optimal inventory cost and number of orders.

13. (a) Describe the iterative procedure of obtaining an optimal sequence in Problems with n jobs and m machines.

Or

SECTION B — (5 × 5 = 25 marks)

Answer ALL questions.

11. (a) Explain the terms: The Earliest and Latest Time of the activities of a project.

Or

(b) Find out the time required to complete the following project and the critical activities:

Activity	Predecessor activity	Optimistic time estimate (t_0 days)	Most likely time estimate (t_m days)	Pessimistic time estimate (t_p days)
A	-	2	4	6
B	A	3	6	9
C	A	8	10	12
D	B	9	12	15
E	C	8	9	10
F	D, E	16	21	26
G	D, E	19	22	25
H	F	2	5	8
I	G	1	3	5

18. Strong Book Binder has one printing machine, one binding machine, and the manuscripts of number of different books. Processing times are given in the following table:

Book	Time in Hours	
	Printing	Binding
A	5	2
B	1	6
C	9	7
D	3	8
E	10	4

Determine the order in which books should be processed on the machines, in order to minimize the total time required.

19. (a) Solve the game with the following pay-off matrix. (5)

		Player B Strategies				
		I	II	III	IV	V
Player A	1	7	5	2	3	9
	2	10	8	7	4	5
	3	9	12	0	2	1
	4	11	-2	-1	3	4

(b) Explain the method of solution of a 2 × 2 game without saddle point. (5)

(b) Shahi Export House has to process five items through three stages of production, viz, cutting. sewing & pressing. Processing times are given in the following table:

Item	Cutting (A_i)	Sewing (B_i)	Pressing (C_i)
1	3	3	5
2	8	4	8
3	7	2	10
4	5	1	7
5	2	5	6

Determine an order in which these items should be processed so as to minimize the total processing time.

14. (a) For the game with the following Pay-Off Matrix, determine the Saddle Point.

		Player B Strategies			
		I	II	III	IV
Player A Strategies	1	2	–1	0	–3
	2	1	0	3	2
	3	–3	–2	–1	4

Or

(b) State the assumptions for Two-Person Zero Sum Game.

15. (a) Write a brief note on the classification of Replacement Problem.

Or

(b) A Machine owner finds from his past records that the maintenance costs per year of a machine whose purchase price is Rs. 8000 are as given below:

Year :	1	2	3	4	5	6	7	8
Maintenance Cost :	1000	1300	1700	2200	2900	3800	4800	6000
Resale price :	4000	2000	1200	600	500	400	400	400

Determine at which time it is profitable to replace the machine.

SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. The following table gives the estimates of optimistic time (t_o), most likely time (t_m) and pessimistic time (t_p) of different activities of a project.

Activity	t_o	t_m	t_p
1-2	4	8	12
2-3	1	4	7
3-4	8	12	16
3-5	3	5	7
4-5	0	0	0
4-6	3	6	9
5-7	3	6	9
5-8	4	8	6